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NOTES ON NORTH AMERICAN SPHAGNUM—VIII

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The Group Cuspidata Lindberg (Continued)

19. *Sphagnum tenellum* Persoon, 1798. This species is commonly referred to by Warnstorf and others as *Sphagnum molluscum* Bruch, 1825, though the name admittedly lacks priority. *S. tenellum* (as synonym) is by Warnstorf cited as of (Ehrhardt) Lindberg and dated 1862, but as a matter of fact Lindberg, in the place referred to by Warnstorf,[1] says nothing whatever about Ehrhardt, but accredits the species to Persoon on the basis of his manuscript name and Bridel's publication in his Mantissa (1819) and says Persoon was the first to discover it, in the Harz (Hercynia). Lindberg's ascription of the species to Ehrhardt is found in a later work, viz. Europas och Nordamerikas Hvitmossor, 22 ff. 1882, and is based upon a specimen of Ehrhardt's (†1795) in the herbarium of the Academy of Science at St. Petersburg labeled "*Sphagnum tenellum* mihi." This is however not a publication, and the reference to Persoon's specimen under the name *S. tenellum* in Hoffmann, Deutschlands Flora, II, 22. 1795, is also not such as to constitute publication. The earliest proper publication (with description) of the species is in Bridel's Muscologia Recentiorum, II, 1, p. 223. As Bridel here definitely credits the species to Persoon, there is hardly anything further to be said. Dusén[2] also has the facts clear, though he calls the species *S. tenellum* Bridel. Warnstorf had himself examined the Bridel herbarium in Berlin and seen that Bridel's specimen really represents this species.[3] His astounding reason[4] for preferring the later name, that Bridel might possibly not have distinguished from his (or Persoon's) species slender forms belonging to other species, is subscribed to by Cardot.[5] The fact that there is a later (invalid) *S. tenellum* (Schimper) Klinggräff, 1872 does not of course invalidate the older one.

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[1] Öfv. kgl. Vet.-Akad. Förh., XIX, 142. 1862.

[2] Sphagnaceernas utbredning, 13 f. 1887.

[3] Bot. Centralblatt, IX, 99. 1882.

[4] Verh. bot. Ver. Prov. Brandenburg, XXXII, 227. 1891.

[5] Répertoire sphagnologique, 337 f. 1897.

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It is a species not easily confused, and one whose immediate relationships are not at once clear, though for some time it has been generally recognized that it belongs to the group *Cuspidata*, and it probably finds its nearest affinity in the several species last considered. Its branch-leaves are hardly undulate when dry, though a slight tendency in that direction is sometimes observable, and are considerably shorter and wider in proportion to their length, giving them an ovate rather than lanceolate shape; in section their chlorophyll cells are particularly broad in their exposure on the dorsal surface and even convexly bulging, but barely, if at all, reaching the ventral surface, where the empty cells are strongly bulging. The cortical cells of the stem are clearly differentiated as in all the following species of the group, normally in two layers of not very large cells with fairly thin walls. Stem-leaves, branch-leaves, perichaetial leaves belong otherwise to the general type of the *Cuspidata*. The species is often used for illustration of the retort-cells of the Sphagnum-branch, as these are remarkably well developed in it, standing out in marked contrast to the other small cells of the branch. The color is usually a delicate yellowish green, rarely more deeply pigmented yellow-brown. It is generally regarded as dioicous, though Warnstorf describes it as polyoicous. I have not succeeded in demonstrating monoicous plants, though in the coastal region of northern Europe I have found the species fruiting rather frequently.

Its distribution is remarkable and with us confined to immediate proximity of the coast. It may thus be found in various localities, often widely separated, from Labrador to New Jersey, and on the Pacific coast from Alaska to Vancouver Island. The circumstances of its occurrence, manner of growth, etc., in a favorable part of its American range are given in considerable detail by Nichols.[6] In Europe it extends northwest to the Faroes and southwest to Portugal, but is not confined to the coast, being reported from most of the mountain systems southward to the Alps. In Asia it is known only from Japan. The facts would seem to indicate Europe as the center of distribution of this species, and it is in general doubtless true that if any region can lay valid claim to being the original home of *Sphagnum*, it is northern Europe.

20. *Sphagnum cuspidatum* Ehrhardt, 1795.[7] About the application of this name there seems neither to have been nor to be any question. A question which has often been raised is whether or not it is specifically distinct from *S. recurvum*. With the segregations of recent decades this question has ceased to be urged, and in my own experience I have failed to find anything that convinces me that *S. cuspidatum* is a mere aquatic form of *S. recurvum*, though there can be no doubt whatever that the relationship is a close one For practical distinction a number of characters have been and may be used, but in doubtful cases one or more of them may be found to fail. It has been noted for example that pendent branches of *S. recurvum* are generally long and closely appressed to the stem,

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[6] The Vegetation of Northern Cape Breton Island, Nova Scotia, 422 and elsewhere. 1918.

[7] On the date of Hoffmann's separate publication of the *Sphagna* for the second volume of his Deutschlands Flora cf. my note in BRYOLOGIST, XX, 84. 1917.

which is quite concealed by them. This arrangement may in some measure make up for the lack of specially differentiated cortical stem-cells in this species. In *S. cuspidatum* on the other hand, which is of more aquatic tendencies, such an arrangement is unnecessary and the stem is quite bare, the pendent branches being inconspicuous and little developed. The stem-leaves of *S. cuspidatum* are distinguished as somewhat fibrillose in the apical part, and as a rule this is true, but it is also a fact that the fibrils may be lacking in stem-leaves of *S. cuspidatum*, while on the other hand, in immature or otherwise abnormal specimens of *S. recurvum*, the stem-leaves may show somewhat of the fibrillose condition of the branch-leaves, a condition of isophylly or hemiisophylly that must always be borne in mind in considering the stem-leaves of any species of *Sphagnum*, for these are obviously a secondary development from the type of the branch-leaves and are accordingly in immature specimens not adequately differentiated, while in other abnormal ones they may approach the same type by reversion. In section the chlorophyll cells of the branch-leaves of *S. cuspidatum* are described as trapezoidal, having a narrower exposure on the ventral surface of the leaf, while those of *S. recurvum* are triangular, the apex of the triangle barely reaching the ventral surface. Normally this is true, but unquestionable specimens of *S. recurvum*, particularly the aquatic forms called *S. fallax* Klinggräff, may be found with the leaf-section of *S. cuspidatum*, just as we have seen before that aquatic specimens of *S. palustre* may show such abnormal chlorophyll cells. I have even seen such specimens of *S. recurvum* var. *tenue*. The character which remains, which to my mind is the least subject to confusion, is the stem-cortex. In *S. cuspidatum* the cortex consists of about two rows of good-sized, fairly thin-walled cells clearly set off from those within. It is possible that aquatic conditions of growth may have some effect upon the cells, but that they can immediately produce a difference such as that between the cortical stem-cells of *S. recurvum* and *S. cuspidatum* is incredible, and *S. fallax* is an aquatic form of *S. recurvum*, which does not show it.[8] Artificial species that have been inserted between them with such names as *S. fallax*, *S. pseudorecurvum*, *S. pseudocuspidatum*, etc., are apparently always satisfactorily referable to either the one or the other. Of other characters than those already mentioned it may be said that the branch-leaves of *S. cuspidatum* are more elongated to almost linear, often without undulations, and that their empty cells are accordingly narrowed and their pores reduced to the mere end-pores on either surface, or nearly so. Of further synonyms *S. virginianum* Warnstorf, 1900 is retained in 1911,[9] though distinguished there neither in key nor description, nor so far as one can see in the specimen, from small forms of *S. cuspidatum*. *S. ruppinense* Warnstorf, 1908, originally Prussian as the name suggests, was given an American locality in 1911,[10] but here also I am unable to find a valid specific distinction. The same is true of *S. Faxonii* Warnstorf, 1908, from New England. From researches of Bartlett[11] it appears that Warnstorf had garbled his statements as to the specimen making up his *S. Faxonii.* In spite of this he retains them in 1911[12] with the further addition of the locality suggested by Bartlett. There is nothing either in the description or in such specimens as are available to separate it specifically from *S. cuspidatum.*

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[8] Cf. the note in BRYOLOGIST, XX, 87. 1917 and the literature there cited.

[9] Pflanzenreich, **51**: 269.

[10] Op. cit., 232.

[11] Rhodora, X, 113 f. 1908.

The species is hardly as widely distributed as *S. recurvum.* On our eastern coast it extends from Labrador[13] southward to Georgia (Florida according to Warnstorf). It seems to be entirely lacking inland and on our Pacific coast. It is well represented in Europe, also in Japan, and forms of it or closely related species occur in various parts of the southern hemisphere.

Var. *Torreyi* (Sullivant) Braithwaite, 1875. Such is the form and date of the name as first applied varietally. The earlier species name was *S. Torreyanum* Sullivant, 1849. Whether it should be called a variety or species is a matter still open to discussion. There is such lack of good characters separating them and it is so possible to find material showing the transition from one form to the other that I am unable to see in them separate species, though I think the variety is abundantly deserving of taxonomic recognition as such. The most immediately apparent distinction lies in the decidedly greater size of the variety. With its robustness goes a greater breadth of branch-leaf, the latter tending then to be somewhat undulate and sometimes showing good-sized pores on the ventral surface of the empty cells. The chlorophyll cells are also not so much exposed on the ventral surface of the leaf, in its lower part being normally triangular in section with apex just reaching the surface of leaf. In all these respects the plant lies nearer to *S. recurvum,* and one could sooner conceive of the variety than of the type as an aquatic form of the latter species. Also the cortical cells of the stem are in the variety more irregular in size, with slightly thicker walls and forming a less definite cortical layer, but the condition is still too far removed from that of *S. recurvum.* Of synonyms Warnstorf has been guilty of one in *S. Kearneyi* Warnstorf, 1900, from the Dismal Swamp of Virginia, which marks at the same time the variety's southern limit of range.[14] From here northward the range is entirely coastal and extends to Newfoundland. In Europe it also shows coastal preferences, though Warnstorf (p. 233) gives a single locality from the Alps. It apparently does not occur elsewhere[15] and compares then as to its range in a general way with *S. pulchrum.*

Var. *serrulatum* Schliephacke, 1882 (first noted as *S. laxifolium* var. *serrulatum,* Schliephacke, 1865). To Schliephacke appears to belong the credit for having first taxonomically registered the fact that *S. cuspidatum* shows in its aquatic specimens an occasional tendency to have its branch-leaves serrulate, the teeth being due solely to a slight extension of the distal ends of the narrow border cells. This might readily be regarded as a casual variation having no taxonomic value, but it is significant that it does not occur in other species,[16] that it is not characteristic of all aquatic specimens of *S. cuspidatum*, and that in some regions this form becomes more frequent or even supplants the normal form entirely. Warnstorf in 1911 leaves two North American species of this category, *S. serratum* Austin, 1877 (including the European form), and *S. trinitense* Carl Müller, 1848,[17] but without any very definite characters to distinguish them from each other.[18] With us the plant is confined to our east coast, the most northerly station being in Maine.[19] It is also known from Massachusetts and becomes common in the southern coastal states, reaching to Louisiana. It further occurs in Bermuda, where it is the only *Sphagnum* except *S. magellanicum*, and in Porto Rico (where it has acquired another synonym, *S. Helleri* Warnstorf, 1905), extending through Trinidad apparently to eastern South America. Warnstorf includes specimens from Japan and Australia, while several of his other species from the southern hemisphere are possibly identical. It is sometimes found richly fruiting, as is normal *S. cuspidatum* in spite of its dioicous inflorescence. The close relationship of *S. Fitzgeraldi* Renauld will be discussed under the latter species.

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[12] Op. cit. 231.

[13] Warnstorf (p. 266) includes it from Greenland, but his station is that of the variety *Kruusei* (not *Krausei*) Jensen, a fragment of which from Jensen's herbarium is certainly referable to *S. Lindbergii.*

[14] It had been collected there before (1893) by Small and rightly named by Warnstorf. Cardot's *S. cuspidatum* var. *miquelonense,* 1887 has long since been reduced to synonymy.

[15] Warnstorf's locality in Tierra del Fuego requires confirmation.

To revert to a species previously discussed, a new locality for *S. Angströmii* has come to light in good specimens from Nome, Alaska, collected in 1918 by C. W. Thornton, which I have been able to examine through the kindness of Mr. Maxon. This is the second station for this subarctic species from the American mainland, the third from North America altogether. Further collecting may show it to be not uncommon in northern Alaska, the Yukon and possibly farther eastward. It is however strange that it has never been reported from Greenland, whose Sphagnum-flora is so well known that one hesitates to believe it can occur there without having been discovered. If it should not in future be found there nor in the adjacent eastern parts of arctic or subarctic America, the conclusion would seem inevitable that it had reached Alaska in its distribution from Asia and had not yet succeeded in spreading across arctic or subarctic America to Greenland.

ITHACA, N. Y.

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[16] Except S. Fitzgeraldi, exotic species having this character are synonyms or closely related.

[17] Separated by nearly 30 pages of print. The author in his Vorwort congratulates himself on the natural arrangement of species in his keys and descriptions.

[18] He puts one of Mrs. Britton's numbers from Pembroke Marsh in the Bermudas under one of the two species and her other number from the same marsh under the other.

[19] A specimen in the Austin herbarium labeled "from a pit in a peat swamp wholly submerged, Hebron, Maine, Aug., 1878" has a note by Austin calling attention to the serrulate leaves. Mr. G. K. Merrill has recently sent me an entirely similar specimen from a "pool in a bog, Union, Maine, Aug. 17, 1919.